1486237 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

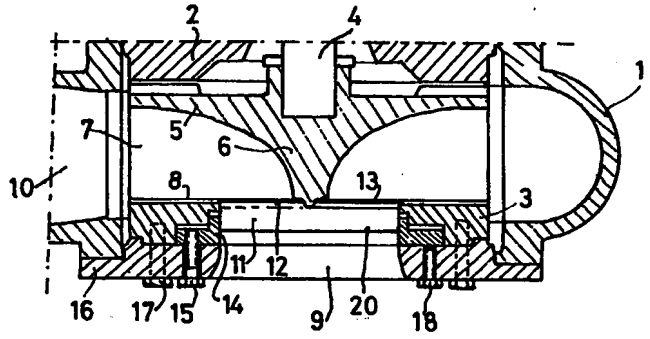

FIG. 1

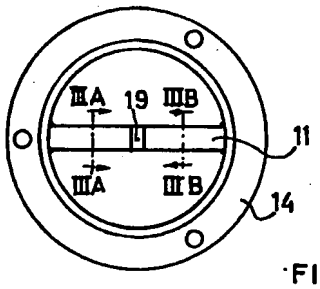

FIG. 2

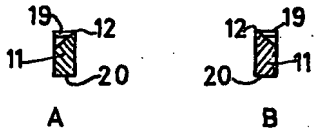

FIG. 3

PATENT SPECIFICATION (11) 1 486 237

1 486 237

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(54) IMPROVEMENTS IN AND RELATING TO CENTRIFUGAL PUMPS

(71) We, LANDUSTRIE SNEEK, MACHINEFABRIEK ELEKTROTECHNIEK B.V., a Dutch Body Corporate of Pieter-Zeemanstraat 6, Sneek, Netherlands, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to centrifugal pumps.

Sewage or similar waste water is usually pumped in purification equipment and the like using centrifugal pumps. However, solids can cause obstructions. Particularly troublesome are plastics sheet materials, such as plastic bags, which can completely cover grids for retaining coarser solids.

According to the present invention, there is provided a centrifugal pump for pumping a liquid containing solids, the pump comprising a pump housing with vanes rotatable therein, a shaft for rotating the vanes, a suction opening coaxial with the vanes in a transverse wall of the pump housing, a discharge opening in a circumferential wall of the housing, a blade extending diametrically of the shaft axis and supported in the suction opening so that a surface of the blade is at a relatively small axial distance from edges of the vanes adjacent the said surface of the blade, the width of the gap between the said edges of the vanes and the said surface of the blade being such that there is obtained between the said edges of the vanes and the said surface of the blade, when the vanes are rotating, a shearing action effective to cause a diminution of the solids, the said surface of the blade being chamfered, with the direction of the chamfer on either side of the rotational axis of the shaft being in opposite directions, and the blade having a planar surface remote from the chamfered surface.

Further according to the present invention, there is provided a centrifugal pump for pumping a liquid containing solids, the pump comprising a pump housing with vanes rotatable therein, a shaft for rotating the vanes, a suction opening coaxial with the vanes in a transverse wall of the pump housing, a discharge opening in a circumferential wall of the housing, a stationary blade extending across the suction opening, said blade having a downstream surface located at a relatively small axial distance from edges of the vanes adjacent the said surface of the blade, the width of the gap between the said edges of the vanes and the said downstream surface of the blade being such that there is obtained between the said edges of the vanes and the said surface of the blade, when the vanes are rotating, a shearing action effective to cause a diminution of the solids, and the blade having an upstream surface which is shaped to cause turbulence in the flow through the suction opening.

An embodiment of the invention will now be described, by way of example only, with reference to the accompanying diagrammatic drawings, in which:

Figure 1 is a partial section of a centrifugal pump in accordance with the present invention;

Figure 2 is a plan view of a part of the pump of Figure 1; and

Figure 3 shows two sections of a part of Figure 2 on lines IIIA-IIIA and IIIB-IIIB- respectively.

The pump shown in the drawings has a pump housing 1, with a substantially circular circumference, and two substantially plane end walls 2 and 3. In the centre of the wall 2 is a shaft 4 coupled to a drive motor (not shown). The shaft 4 projects into the pump. A vane holder 5 with a hub 6 is connected to the shaft 4. Holder 5 has a number of vanes 7. Vanes 7 are curved as in hitherto proposed pumps, and they extend as far as the hub 6 of the holder 5. Vanes 7 are connected to the holder 5 only at the hub

so that each vane has a free lower edge lying in a plane perpendicular to the shaft 4 and a free side edge facing the circumferential wall of the housing. The edges 8 are at a small distance from the planar end wall 3.

In the centre of the wall 3 is a suction opening 9 connected to a suction duct (not shown). A connection 10 for a discharge duct opens in a lateral part of the housing 1, and connection 10 extends substantially tangentially to the circumference of the housing 1.

A stationary diametrically-extending blade in the form of a knife bar 11 is located in the suction opening 9. The upper or downstream side 12 of the bar 11 is straight and at a small distance from the plane of the edges 8 of the vanes 7 so that a narrow axial gap 13 remains between edges 8 and bar 11.

The bar 11 is fixed to an annular flange 14 mounted on a cover 16 by a plurality of bolts 15. The wall 3 is connected to the cover 16 by bolts 17. The wall 3 and cover 16 are so arranged as to permit the flange 14 to be moved in order to adjust the width of the gap 13. For this purpose, additional bolts 18 in cover 16 cooperate with the flange 14, so that the width of the gap 13 can be adjusted by slight elastic deformations of the flange 14 on appropriate rotation of bolts 15 and 18.

The width of the gap 13 is such that rotation of the vanes 7 produces a shearing action between the curved vanes 7 and upper side 12 of the bar 11 and which causes diminution of solid matter in the flow. Moreover bar 11 has a chamfered upper side as shown in Figure 3 which forms a sharp knife edge. This chamfer is in opposite directions on either side of centre 19, so that a similar cutting action is obtained on both sides of centre 19.

As shown in Figure 3, the lower or upstream surface 20 of the bar 11 is flat whereby cavities and turbulence tend, as a result, to be generated in the resultant liquid flow so that threads, fibres, and the like will be dragged passed this lower side and not get caught thereby. Rounding or bevelling of the bar 11 will reduce the flow resistance but the chances of catching threads and fibres etc., will be increased.

In a modified form of the pump (not shown) the surface of the wall 3 facing the edges 8 of the vanes 7 may be provided with a number of radially directed grooves extending from the inner circumferential edge of the wall 3 to the outer circumferential edge thereof; for example, there may be four such grooves distributed uniformly about the axis of the opening 9, although other numbers of grooves can be used. When, during operation of the pump, solids are deposited on wall 3, these solids can be driven sideways and outwardly by the edges 8 of the vanes 7. The solids gradually collect in the radial grooves. The liquid flows generated by the pump will then gradually drive these solids outwardly of the grooves, and in this manner jamming of the pump can be avoided.

A similar mode of operation can be obtained if the wall 3 is not planar and the edges 8 of the vanes 7 have a corresponding curvature. However, the manufacture of such walls, and in particular the grooves, will usually be simpler with a planar or conical wall than with a curved wall.

The hereinbefore described embodiment has been found to reduce the size of solids for example in sewage or wastewater, so that obstructions thereby can be avoided. When a wall of the pump housing has a plurality of radially-extending grooves therein, the liquid flow generated by the pump vanes gradually removes deposits of solids therefrom.

WHAT WE CLAIM IS:—

1. A centrifugal pump for pumping a liquid containing solids, the pump comprising a pump housing with vanes rotatable therein, a shaft for rotating the vanes, a suction opening coaxial with the vanes in a transverse wall of the pump housing, a discharge opening in a circumferential wall of housing, a blade extending diametrically of the shaft axis and supported in the suction opening so that a surface of the blade is at a relatively small axial distance from edges of the vanes adjacent the said surface of the blade the width of the gap between the said edges of the vanes and the said surface of the blade being such that there is obtained between the said edges of the vanes and the said surface of the blade, when the vanes are rotating, a shearing action effective to cause a diminution of the solids, the said surface of the blade being chamfered, with the direction of the chamfer on either side of the rotational axis of the shaft being in opposite directions, and the blade having a planar surface remote from the chamfered surface.

2. A pump according to claim 1, wherein the said edges of the vanes lies in a plane perpendicular to the rotational axis of said shaft.

3. A pump according to claim 1 or claim 2, further comprising means for adjusting the width of said gap.

4. A pump according to claim 3, wherein the blade is fixed to an annular flange mounted on the wall of the pump housing around the suction opening.

5. A pump according to claim 4, wherein means for adjusting the width of the gap comprises means for moving the annular flange relative to the said circumferential wall of the pump housing.

6. A pump according to any one of the preceding claims, wherein a surface of the transverse wall facing the said edge of the vanes is provided with a plurality of substantially radially extending grooves therein.

7. A centrifugal pump for pumping a liquid containing solids, the pump comprising a pump housing with vanes rotatable therein, a shaft for rotating the vanes, a suction opening coaxial with the vanes in a transverse wall of the pump housing, a discharge opening in a circumferential wall of the housing, a stationary blade extending across the suction opening, said blade having a downstream surface located at a relatively small axial distance from edges of the vanes adjacent the said surface of the blade, the width of the gap between the said edges of the vanes and the said downstream surface of the blade being such that there is obtained between the said edges of the vanes and the said surface of the blade, when the vanes are rotating, a shearing action effective to cause a diminution of the solids, and the blade having an upstream surface which is shaped to cause turbulence in the flow through the suction opening.

8. A centrifugal pump for pumping a liquid containing solids, the pump being substantially as herein described with reference to Figures 1 to 3 of the accompanying drawings.

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